UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
BIN C15700
Seattle, WA 98115-0070

August 5, 2002

Thomas F. Mueller
Chief, Regulatory Branch
Department of the Army
Seattle District, Corps of Engineers
Post Office Box 3755
Seattle, Washington 98124-3755

Re: Biological Opinion and Essential Fish Habitat Consultation for the Pierce County Terminal Expansion at the Port of Tacoma (WSB-01-345, COE No. 2000-2-00765)

Dear Mr. Mueller:

In accordance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq*.) and the Magnuson Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996, the attached document transmits the National Marine Fisheries Service's (National Oceanic and Atmospheric Administration (NOAA Fisheries)) Biological Opinion (Opinion) and MSA consultation on the issuance of a permit for construction of the Pierce County Terminal Expansion at the Port of Tacoma within Commencement Bay in Pierce County, Washington. The Army Corps of Engineers (COE) determined that the proposed action may affect, and is likely to adversely affect the Puget Sound (PS) chinook (*Oncorhynchus tshawytscha*) Evolutionarily Significant Units (ESUs).

This Opinion reflects the results of a formal ESA consultation and contains an analysis of effects covering the PS chinook in Commencement Bay, Washington. The Opinion is based on information provided in the Biological Assessment (BA) sent to NOAA Fisheries by the COE, and additional information transmitted via meetings, telephone conversations, fax, and e-mail. A complete administrative record of this consultation is on file at the Washington Habitat Branch Office.

The NOAA Fisheries concludes that implementation of the proposed project is not likely to jeopardize the continued existence of PS chinook or result in destruction or adverse modification of its habitat. In your review, please note that the incidental take statement, which includes Reasonable and Prudent Measures and Terms and Conditions, were designed to minimize incidental take.

The MSA consultation concluded that the proposed project may adversely impact designated Essential Fish Habitat (EFH) for chinook salmon. The Reasonable and Prudent Measure of the ESA consultation, and Terms and Conditions identified therein, would address the negative effects resulting from the proposed COE actions. Therefore, NOAA Fisheries recommends that they be adopted as EFH conservation measures.

If you have any questions, please contact Shandra O'Haleck of the Washington Habitat Branch Office at (360)753-9533.

Sincerely,

For Michael R Crouse

D. Robert Lohn
Regional Administrator

Enclosure

Endangered Species Act - Section 7 Consultation
Biological Opinion
&
Magnuson-Stevens Act
Essential Fish Habitat Consultation

WSB-01-345

Pierce County Terminal Expansion Project
Blair Waterway, Commencement Bay
Port of Tacoma, Washington

Agency: United States Army Corps of Engineers

Consultation Conducted By: National Marine Fisheries Service,
Northwest Region

Approved: Michael R Crouse
For D. Robert Lohn
Regional Administrator

Date: August 5, 2002

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1.0 INTRODUCTION

1.1 Background and Consultation History

On July 25, 2001, the National Marine Fisheries Service (National Oceanic and Atmospheric Administration (NOAA Fisheries)) received a Biological Assessment (BA) and a request for Endangered Species Act (ESA) section 7 consultation from the United States Army Corps of Engineers (COE). After meeting with the COE and the Port, and receiving additional clarifying information, NOAA Fisheries concurred with the COE effect determination of Likely to Adversely Affect. Formal ESA consultation was initiated on May 5, 2002. The proposed project occurs within the Puget Sound (PS) chinook (*Oncorhynchus tshawytscha*) Evolutionary Significant Unit (ESU). Blair Waterway, the site of the proposed project, is one of several waterways located within the industrial area of Commencement Bay. Intertidal habitat will be developed from 1.36 acres of upland in an overall goal to minimize the effects of past expansion within the larger Commencement Bay landscape.

The objective of this Biological Opinion (Opinion) is to determine whether the proposed project is likely to jeopardize the continued existence of PS chinook. The standards for determining jeopardy are described in section 7(a)(2) of the ESA and further defined in 50 C.F.R. 402.14. This Opinion is based on information provided in the BA, the Mitigation Plan, meetings, mail correspondence, e-mail correspondence, and phone conversations. This document also presents NOAA Fisheries' consultation covering Essential Fish Habitat (EFH) under the Magnuson-Stevens Fishery Conservation and Management Act (MSA).

The Maersk Sealand Biological Opinion (Maersk Opinion) provided a detailed examination of the impacts of pier construction in Commencement Bay on Puget Sound chinook. The Port has written the Pierce County Terminal (PCT) Expansion BA to incorporate conditions negotiated during the Maersk Opinion (NOAA Fisheries 2001a). Much of the information researched during the Maersk Opinion is relevant to this project and is referenced where applicable.

1.2 Description of the Proposed Action

The COE proposes to issue a permit to the Port of Tacoma covering construction activities to convert an existing bulk cargo handling facility into a container shipping terminal. The existing pier at PCT was constructed in 1971, expanded in1975, and has been used for loading and unloading of bulk cargo and automobiles since it was developed. The average size of cargo vessels ranged in size from approximately 570 to 680 feet in length and approximately 90 to 105 feet in width, with a draft of 29 to 38 feet. In 1999, the Blair Waterway navigation channel and certain berth areas were dredged to -51 Mean Lower Low Water (MLLW) to eliminate navigational inefficiencies for post-Panamax shipping vessels. The post-Panamax vessel has an overall length of approximately 960 feet and is approximately 130 feet wide, with a draft of approximately 46 feet. The proposed widening of the turning basin would allow adequate clearance between the larger ships berthed at the facility and turning basin activities.

To enlarge the turning basin, the shoreline will be lengthened by 784 feet to 3,530 feet (figure 1). The "cutback" distance will range from 0 feet at the north end of the Project Area to approximately 560 feet at the southeastern end of the waterway adjacent to the existing PCT pier. Approximately 2.1 million cubic yards of material will be dredged from the water using a barge mounted dredge with a clamshell bucket which will minimize entrainment. A floating boom will be used to contain material that may float from the area. This cutback will create 17.1 acres of subtidal habitat. Wapato Creek drains into the Blair Waterway through a culvert that extends from the east side of Alexander Avenue to the outlet at this point. The cutback will shorten the culvert by approximately 584 feet. Although Wapato Creek is not considered a chinook stream, the cutback, along with an upgraded outfall, will provide a more efficient passage for fish, such as coho (*O. kisutch*) and chum (*O. keta*). A new 1,200 foot pier will be constructed on the east face of the expanded waterway. The structure will be supported on 441 concrete and 240 steel pilings (24 inch in diameter). The fender pile system for the new pier will consist of 64, 18-inch concrete or steel piles.

In the southwest corner of the basin, approximately 4,000 cubic yards of material will be dredged to allow an extension of an existing pier and to enable maneuverability for ships. Approximately 350 square feet of intertidal/shallow subtidal below -2 MLLW will be converted to subtidal habitat. Erdahl Ditch outfalls into the southwest corner of the Blair Waterway through a 0.17 acre mudflat, intertidal and shallow subtidal habitat. Although the site will be covered with the pier extension, the project has been designed to avoid dredging of the mudflat area. The existing pier will be extended 134 feet westward and 484 feet eastward and will support seven container cranes. A new mooring dolphin will be installed in the southeast corner of the waterway and catwalks will be constructed to access the mooring dolphins located at the end of each pier. Truck accessways are proposed at the end of each pier to allow container yard trucks to drive on and off the piers for loading and unloading operations. The accessways have been designed to use the minimum turning radius needed to reduce shading impacts. The pier extensions and truck accessways will be supported on 258 concrete and 130 steel pilings. Eight concrete pilings will be installed to support the two new catwalks and 284 concrete piles will be placed under the existing pier to support the container cranes. All structural support pilings will be 24 inches in diameter. The existing 144 creosote piling fender system will be replaced with 108, 18-inch concrete pilings or steel pilings. The steel pilings for the structural support will be located close to MHHW (Mean Higher High Water) or above. Pilings used for the fender system will be located 120 feet from shore at approximately -51 MLLW. Due to substrate constraints, all piling will be driven with an impact pile driver. If steel pilings are used for the fender system, hydroacoustic monitoring will take place to ensure that sound levels are below injurious levels. The number of pilings needed for the project have been minimized through the use of larger pilings which can support greater loads. The use of concrete pilings instead of treated wood will provide greater light illumination and reduce water quality concerns.

All dredged material, that is determined to be suitable for open water disposal pursuant to Puget Sound Dredged Disposal Analysis (PSDDA), will be disposed of at the approved Department of

Figure 1

Natural Resources (DNR) Commencement Bay site. In the event that a portion of the material is determined to be unsuitable for open water disposal, it will be transported to an appropriate upland disposal site. If the Port determines to use some of the material for beneficial use (as part of this project or other projects), it will be transported to the specific location. Such use of material for other projects will be implemented under separate COE permits.

For shoreline protection, riprap will be placed approximately from the top of the slope to -51 MLLW. All new riprap above -10 MLLW will have two and one-half inch minus angular rock placed in the interstices to enhance productivity of the habitat. Below -10 MLLW, all material will be covered with sandy dredge material. The two and one-half inch minus angular rock and the sandy dredge material will provide a higher quality substrate to improve benthic invertebrate biological production.

1.3 Description of the Action Area

The Action Area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 C.F.R. 402.02).

The Action Area for the proposed project is considered to be the area southeast of a line running from the end of the training wall on the east side of the Puyallup River to Browns Point. The Action Area encompasses the portion of Commencement Bay and the shoreline that is southeast of this line, including all of Sitcum, Blair, and the Hylebos waterways and their shorelines, and the Milwaukee Habitat Area (mouth of the former Milwaukee Waterway) and its shoreline.

The geographic limits of the Action Area were defined by considering the potential reach of the mechanisms that may lead to impacts on the species of concern. Overall, there are 310 acres of intertidal and shallow subtidal habitat and 1,212 acres of water column habitat located within the Action Area (Pacific International Engineering 2000).

2.0 ENDANGERED SPECIES ACT

2.1 Biological Opinion

2.1.1 Status of the Species

PS chinook salmon was listed on March 24, 1999 (64 Fed. Reg. 14308; March 24, 1999). The species status review identified the high level of hatchery production which masks severe population depression in the ESU, as well as severe degradation of spawning and rearing habitats, and restriction or elimination of migratory access as causes for the range-wide decline in PS chinook salmon stocks (NOAA Fisheries, 1998a, and 1998b). Within the Puyallup basin, virtually all salmon spawn in the Puyallup River, outside of Commencement Bay. The naturally spawning chinook population in the Puyallup River is comprised of an unknown mixture of natural and hatchery origin fish.

Juvenile chinook, migrating through the Puyallup River delta and Commencement Bay originate from three basic stocks (SASSI, 1992): White (Puyallup) River spring; White River summer/fall; and Puyallup River fall. Juvenile salmon use estuaries for physiological adaption, foraging, and refuge. As described by Simenstad (2000), some aspects of the early life history of juveniles in estuaries are obligatory, such as the physiological requirement to adapt from freshwater to saltwater. Generalized habitat requirements of juvenile chinook in estuaries include shallow-water, typically low gradient habitats with fine unconsolidated substrates and aquatic, emergent vegetation; areas of low current and wave energy; and concentrations of small epibenthic invertebrates (Simenstad *et al.* 1985).

Artificial propagation programs likely provide most of the numbers of chinook in the Puyallup River. The White River spring chinook population which is considered critical by state and tribal fisheries managers depends largely on artificial production (SASSI 1992). The White River spring chinook have lately experienced a tenuous rebound as escapement gradually has increased from the historic lows of the 1980s. In 2000, non-tagged returns of adults was 1,732 individuals, the largest return in 30 years. This increase is consistent with larger numbers of chinook in the Columbia River during 2000, indicating good ocean survival (NOAA Fisheries 2001a).

The White River summer/fall chinook stock is considered wild and classified by the co-managers as distinct based on geographic distribution. The glacial melt waters, typical of the Puyallup River, cause poor visibility during spawning season. Due to this, the stock status is unknown (SASSI 1992).

Numbers of Puyallup fall chinook have recently been compiled by the Puyallup Tribe of Indians for the Washington State Shared Strategy indicating the current number of spawners at 2,400. The Washington Shared Strategy is a voluntary and collaborative effort that is developing goals for recovery planning ranges and targets building on existing efforts of local governments, watershed groups, and various state, federal, and tribal entities to produce a viable recovery plan. Targets relating the quality and capacity of chinook habitat to population response associated with recovered habitat indicated a range of 5,300 to 18,000 spawners necessary for a recovered system (Puyallup Tribe 2002).

Field observations of PS chinook in the action area revealed that habitat use differed between the mouth and the head of waterways and also between the locations of the waterways in relation to the Puyallup River. The Puyallup Tribe of Indians conducted beach seine sampling between the years 1980 -1995 (however, no data were available in 1988, 1989, and 1990). Dukar *et al* (1989) conducted an extensive beach seine juvenile sampling effort in 1983 at many of the beach seine sampling location as the tribe's efforts plus tow net sampling to investigate distribution in the open water habitats of Commencement Bay. In addition, sampling of salmonid distribution has been conducted at a number of sites during a course of impact assessment and/or mitigation site planning. Some general conclusions from these studies indicated that: juvenile chinook are present in low numbers in March, peak in late May or early June and drop to low numbers again by July 1; the progeny of naturally spawned chinook arrive in the estuary throughout this period at a variety of lengths; offshore catches of chinook peak about two weeks later than shoreline catches; and all shorelines are used but catches are typically higher near the mouths of the waterways than near the heads (Kerwin 1999). Hooper (USFWS 2001) compiled catch per unit effort of chinook salmon at sites close to and further away from the Puyallup River. This data found that the catch per unit effort averaged 20.4 in the Milwaukee Waterway, 2.93 in the Blair Waterway and 1.99 in the Hylebos Waterway. The catch per unit was higher in the waterways closest to the river (USFWS 2001).

2.1.2 Evaluating Proposed Actions

The standards for determining jeopardy are set forth in section 7(a)(2) of the ESA as defined by 50 C.F.R. Part 402 (the consultation regulations). NOAA Fisheries must determine whether the action is likely to jeopardize the listed species and/or whether the action is likely to destroy or adversely modify critical habitat. This analysis involves the initial steps of: (1) defining the biological requirements and current status of the Listed species; and (2) evaluating the relevance of the environmental baseline to the species' current status.

From that, NOAA Fisheries evaluates whether the action is likely to jeopardize the listed species by determining if the species can be expected to survive with an adequate potential for recovery. In making this determination, NOAA Fisheries must consider the estimated level of injury or mortality attributable to: (1) collective effects of the proposed or continuing action, (2) the environmental baseline, and (3) any cumulative effects. This evaluation must take into account measures for survival and recovery specific to the listed species' life stages that occur beyond the Action Area. If NOAA Fisheries finds that the action is likely to jeopardize, NOAA Fisheries must identify reasonable and prudent alternatives for the action.

Generally, NOAA Fisheries' jeopardy analysis considers direct or indirect mortality of fish attributable to the action. For this specific action, NOAA Fisheries' analysis considers the extent to which the proposed action impairs the function of habitat elements necessary for rearing, refugia, and migration of the PS chinook salmon. The proposed project occurs within the PS chinook (*Oncorhynchus tshawytscha*) Evolutionary Significant Unit (ESU). Blair Waterway, the site of the proposed project, is one of several waterways located within the industrial area of Commencement Bay.

2.1.3 Biological Requirements

The first step NOAA Fisheries uses when applying the ESA section 7(a)(2) to the listed ESUs considered in this Opinion is to define the species' biological requirements within the action area. NOAA Fisheries also considers the current status of the listed species taking into account species information, e.g., population size, trends, distribution, and genetic diversity. To assess the current status of the listed species within the action area, NOAA Fisheries starts with the determinations made in its decision to list for ESA protection the ESUs considered in this Opinion and also considers any new data that are relevant to the determination.

Relevant biological requirements are those necessary for the listed ESU's to survive and recover to naturally reproducing population sizes at which protection under the ESA would become unnecessary. This will occur when populations are large enough to safeguard the genetic diversity of the listed ESUs, enhance their capacity to adapt to various environmental conditions, and allow them to become self-sustaining in the natural environment. The biological requirements for PS chinook include food (energy) source, flow regime, water quality, habitat structure, passage conditions (migratory access to and from potential spawning and rearing areas), and biotic interactions (Spence et al. 1996). The specific biological requirements for PS chinook that are influenced by the underlying action include food, water quality, habitat structure, and biotic interactions.

2.1.4 Environmental Baseline

The environmental baseline represents the current basal set of conditions to which the effects of the proposed action would be added. The term "environmental baseline" means "the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process" (50 C.F.R. 402.02).

Numerous activities affect the present environmental baseline conditions in the Action Area including expanding urban development, railroads, shipping, logging, agriculture, and other industries. The present port area of Tacoma was created during the late 1800s and early part of the 1900s by filling the tidal marsh that had developed on the shelf of the Puyallup River delta. Continuing habitat alterations such as dredging, relocation and dyking of the Puyallup River, dredging/construction of the waterways for purposes of navigation and commerce, steepening and hardening formerly sloping and/or soft shorelines with a variety of material, and the ongoing development of the Port of Tacoma and other entities has resulted in substantial habitat loss (Sherwood *et al*, 1990, Simenstad *et al*, 1993). Historically, this area comprised the estuarine delta of the Puyallup River. With the growth and development of Tacoma, its port, and the surrounding region, the delta has been subjected to dramatic environmental changes, primarily from dredging and filling to create the waterways. Past development activities along the shorelines of Commencement Bay have affected, and future activities may affect, the habitat and the fish that use it (Duker *et al.* 1983). It has been estimated that of the original 2,100 acres of historical intertidal mudflat, approximately 180 acres remain today (US Army Corps of Engineers *et al* 1993). Fifty-five acres of the 180 acres of low gradient habitat is located near the mouth of the Puyallup River, twenty acres is the Milwaukee habitat area, 18 acres is located bayward of the East 11th Street bridge in the Hylebos Waterway, 54 acres are located in the rest of the Hylebos Waterway, 46 acres is present along the shoreline from the mouth of the Hylebos to Browns Point, and eight acres are located in the Blair Waterway (Pacific International Engineering 2001). Graeber (1999) states that 70 percent of Commencement Bay estuarine wetlands and over 96 percent of the historic Puyallup River estuary wetlands have been lost over the past 125 years. The historical migration routes of anadromous salmonids into off-channel distributary channels and sloughs have largely been eliminated and historical saltwater transition zones are lacking (Kerwin 1999). Additionally, the chemical contamination of sediments, in certain areas of the Bay, has compromised the effectiveness of the habitat (US Army Corps of Engineers, 1993; US Fish and Wildlife Service and NOAA, 1997).

In 1981, the U.S. Environmental Protection Agency (EPA) listed Commencement Bay as a federal Superfund site. As a result of this, the clean up of contaminants has been a high priority and has resulted in 63 of 70 sites remediated (Kerwin 1999). In 1993-1995, the entire Blair Waterway navigation channel was dredged as part of the Sitcum Waterway Remediation Project. Contaminated sediments were removed and capped in the Milwaukee Waterway nearshore confined disposal site. After the completion of the dredging, the EPA deleted the Blair Waterway and all lands that drain to the Blair Waterway from the National Priorities List (Pacific International Engineering 2001).

The shorelines of Commencement Bay have been highly altered by the use of riprap and other materials to provide bank protection. Blair Waterway comprises seven percent of the total of bulkheads that cover 71 percent of the length of the Commencement Bay shoreline. Based on shoreline surveys and aerial photo interpretation of the area, approximately five miles, or 20 percent of the Commencement Bay shoreline, is covered by wide over-water structures (Kerwin 1999). These highly modified habitats generally provide poor habitat for salmon (Spence *et al* 1996).

From 1917 to 1927, most of the habitat alteration (162 acres of mudflat, 72 acres of marsh) resulted from dredging the various waterways and from filling to build uplands for piers, wharves, and warehouses (USFWS and NOAA 1996) The outer portion of the Blair Waterway was constructed during this time. Currently natural aquatic habitats are highly fragmented and dispersed across the delta and Bay with few natural corridors linking them. Fish preferentially occupy what shallow water they can, including mitigation and restoration sites (Miyamoto *et al* 1980, Dukar *et al* 1989, Pacific International Engineering 1999) both north and south of the river mouth, although perhaps tending more to the north (Simenstad 2000). The use of Commencement Bay as a rearing and migration corridor has been documented (Pacific International Engineering 1999, SASSI 1992, Duker *et al* 1989, Simenstad *et al* 1982, Simenstad 1999, Simenstad 2000). Some modified and relict habitats and most mitigation habitats along the delta front and in the waterways still support juvenile salmon by providing attributes such as food and refuge. Whether juvenile salmon suffer decreased growth and condition, and thus increased mortality, by their migration through and residence in the delta-Bay system remains unresolved, and certainly not quantified (Simenstad 2000).

At present, salmonid habitat within Commencement Bay shorelines is gradually increasing in acreage because of habitat restoration projects and natural processes. Approximately 50 acres of intertidal and shallow subtidal habitat have been created through previous restoration actions.

The Port currently comprises 2,400 acres of upland that support numerous commercial or industrial activities located on or adjacent to each of the waterways (Blair, Hylebos, and Sitcum). Some of these industries include pulp and lumber mills, shipbuilding and ship repair facilities, shipping docks, marinas, chlorine and chemical production, concrete production, aluminum smelting, oil refining and food processing plants, automotive repair shops, railroad operations, and numerous other storage, transportation, and chemical manufacturing plants.

2.1.5 Effects of the Proposed Action

The proposed terminal expansion, pier construction, and all related construction activities are likely to adversely affect PS chinook. NOAA Fisheries' ESA implementing regulations define "effects of the action" as "the direct and indirect effects of an action on the species or habitat together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline" (50 C.F.R. 402.02). "Indirect effects" are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur.

2.1.5.1 Direct Effects

Direct effects are the immediate effects of the project on the species or its habitat. Direct effects result from the agency action and include the effects of interrelated and interdependent actions. Future federal actions that are not a direct effect of the action under consideration (and not included in the environmental baseline or treated as indirect effects) are not evaluated (USFWS and NOAA Fisheries 1998).

The direct effects of the project are related to the nature, extent, and duration of the construction activities in the water and whether the fish are migrating and rearing at that time. Direct effects of the project are also related to immediate habitat modifications resulting from the project. In the proposed project, short term negative effects may occur during various construction activities. These activities include: dredging, pile driving, and pile removal. Other actions such as shoreline use of riprap, increased stormwater runoff, increased over water structure, artificial lighting, and construction of the intertidal beach in the Hylebos Waterway may have both direct and indirect effects.

2.1.5.1.1 Dredging

The project includes dredging of approximately 2.1 million cubic yards of material. To minimze the effects of dredging, this action will include timing restrictions, the use of a floating boom to contain material that may float from the area, and the use of clamshell dredging equipment to minimize entrainment. And, in order to minimize potential adverse effects on water quality during dredging, the dredging will be conducted in a manner that is consistent with the Water Quality Certification and Short-Term Modification to the Washington State Water Quality Standards as administered by the Department of Ecology.

Direct effects of construction dredging generally include animal injury by entrainment and burial, and behavioral effects caused by temporarily altered estuarine and marine conditions through changes in turbidity and dissolved oxygen. Long-term ecosystem effects generally include changes in the extent of habitat, periodic changes to primary and secondary production (food web effects), and changes in hydrodynamics and sedimentology (Nightingale and Simenstad 2001). The potential mechanisms by which turbidity could affect salmonids include direct mortality, sublethal effects (stress, gill damage, and increased susceptibility to disease), and behavioral responses (disruptions to feeding or migration) (Pacific International Engineering 2001).

Clamshell or bucket dredges have a bucket of hinged steel with a "clamshell" shape that is suspended from a crane. The crane is mounted on a barge, and during the dredging operation an anchoring system with tugs and/or spuds is used to control and position the barge. The bucket, with its jaws open, is lowered to the bottom surface. When the force of the bucket weight hits the bottom, the clamp grabs a section of sediments (Nightingale and Simenstad 2001). Clamshell dredges, because of the open jaws during descent, are less likely to entrap or contain a mobile organism (Pacific International Engineering 2001).

Although juveniles of many fish species thrive in rivers and estuaries with naturally high concentrations of suspended sediments (SS), studies have shown that the size and shape of SS as well as the duration of exposure can be important factors in assessing risks posed to salmonid populations (McLeay *et al* 1987; Servizi and Martens 1987, 1991; Murphy *et al* 1989; Northcote and Larkin 1989; Newcombe and MacDonald 1991). Studies have shown that finer materials such as silt or clay remain in suspension longer than heavier materials such as sand (Thackston and Palermo 1998). Dredge plume analysis at the Port of Oakland found that fine silts settled at approximately four feet per day while fine sand sank to the bottom within minutes (MEC Analytical 1997).

Dredging during the proposed action would cause a short-term change in the characteristics of the subtidal benthic community; however, this community is expected to recover rapidly after dredging, based on the results of studies in other areas (Pacific International Engineering 2001). For example, Romberg *et al* (1995), studying a subtidal sand cap placed to isolate contaminated sediments in Elliot Bay, identified 139 species of invertebrates five months after placement of the cap. The benthic community reached its peak population and biomass approximately two and one-half years after placement of the cap, then decreased, while the number of species increased to 200 as long-lived species recruited to the population (Wilson and Romberg 1996).

Adverse effects on Puget Sound chinook are expected to be minimal due to timing restrictions imposed for the activity, the use of clamshell dredging equipment, the use of a boom to contain material that may float from the site, and the sandy composition of the dredge material. Additionally, few adult chinook are expected to enter the project area as the Blair Waterway is not on the migration path to the Puyallup River (Pacific International Engineering 2001). And, in order to minimize potential adverse effects on water quality during dredging, the dredging will be conducted in a manner that is consistent with the Water Quality Certification and Short-Term Modification to the Washington State Water Quality Standards as administered by the Department of Ecology.

2.1.5.1.2 Pile Driving

This project will include the installation of 983 concrete pilings, 370 steel pilings, and 172 concrete or steel fender pilings. To minimize effects the project will include timing restrictions, the use of concrete instead of steel for structural pilings, operating the pile driving equipment in a prudent manner, and the use of hydroacoustic monitoring to determine if sound levels may be injurious.

The greatest potential impact from pile driving is from the underwater sound pressure waves that originate when an impact pile hammer contacts the top of a steel pile. The impact of the hammer on the top of the pile causes a wave to travel down the pile and causes the pile to resonate radially and longitudinally like a gigantic bell. Based on the known range of salmonid hearing, pile driving noise would be expected to be heard by salmonids within 600 meters of the noise source, although salmon at this range may not exhibit any visible response (Feist *et al* 1992). Impact pile driving can generate sound pressure levels in excess of 192 dB (re: 1 μPa)(Carlson 1997), which is above the 180 dB (re: 1 μPa) shown to damage the inner ear of a non-salmonid fresh-water fish, *Astronotus ocellatus* (Hastings *et al* 1996).

Barotraumas are pathologies associated with exposure to drastic changes in pressure. These include hemorrhage and rupture of internal organs, including the swim bladder and kidneys in fish. Death can be instantaneous, occur within minutes after exposure, or occur several days later. Gisner (1998) reports swim bladders of fish can perforate when exposed to blast and high-energy impulse noise underwater. If the swim bladder bursts and the air escapes from the body cavity or is forced out of the pneumatic duct, the fish may sink to the bottom. If the swim bladder bursts but the air stays inside the body cavity, the fish is likely to stay afloat but have some difficulty in maneuvering or maintaining orientation in the water column (NOAA Fisheries 2001b)

Fish can also die when exposed to lower sound pressure levels if exposed for longer periods of time. Hastings (1995) found death rates of 50 percent and 56 percent for gouramis (*Trichogaster sp.*) When exposed to continuous sounds at 192 dB (re: 1 μPa) at 400 Hz and 198 dB (re: 1 μPa) at 15 Hz, respectively, and of 25 percent for goldfish (*Carassius auratus*) when exposed to sounds of 204 dB (re: 1 μPa) at 250 Hz for two hours or less. Hastings (1995) also reported that acoustic "stunning," a potentially lethal effect resulting in physiological shutdown of body functions, immobilized gourami within eight to thirty minutes of exposure to the aforementioned sounds (NOAA Fisheries 2001b).

One of the few studies in Puget Sound was the work completed by Feist *et al* (1992) who conducted a pilot study to assess the effects of pile driving on the behavior and distribution of juvenile salmonid at three estuarine locations. Though no underwater sound measurements are available from that study, comparisons between juvenile salmon schooling behavior in areas subjected to pile driving/construction and other areas where there was no pile driving/construction indicate that there were fewer schools of fish in the pile-driving areas than in the non-pile driving areas. The results are not conclusive but there is a suggestion that pile-driving or construction operations may result in a disruption in the normal migratory behavior of the salmon in that study, though the mechanisms salmon may use for avoiding the area are not understood at this time (NOAA Fisheries 2001b).

Between 440 and 4,440 meters from an active pile driving operation, sound pressure levels are predicted to attenuate from 189 dB (re: 1 μPa) to approximately 150 dB (re: 1 μPa), respectively. Within this area, listed salmonids may exhibit temporary abnormal behavior indicative of stress or exhibit a startle response, but not sustain permanent harm or injury. However, there is some uncertainty about the potential for injury to fish from sound pressure levels in this range, because Hastings has information that suggests damage to the inner ear may occur at levels greater than 150 dB (re: 1 μPa). Hasting concludes that 150 dB (re: 1 μPa) is a safe upper limit for relatively short exposures (M. Hastings, 2001 as cited in NOAA Fisheries 2001b).

To assess the environmental and technical factors involved in driving very large piles for the East Span, San Francisco - Oakland Bay Project, a Pile Installation Demonstration Project (PIDP) was undertaken in late 2000 in which three eight-foot diameter steel pipe pilings were driven into the San Francisco Bay (Illingworth and Rodkin 2001). The underwater sound measurements were not comprehensive, but important data came from measurements at hydrophone depths of 1 and 6 meters. Using a pile-driver energy of 900 kJ, peak pressure of 207 dB (re: 1 μPa) was measured at a distance of 103 meters and 191 dB (re: 1 μPa) at a distance of 358 meters (NOAA Fisheries 2001b).

At the Baldwin Bridge piers in Connecticut, underwater acoustic measurements from the demolition pounding of a “hoe ram” were recorded by Dolat (1997). The ram struck the cement pier approximately four times per second creating loud pulsed sine waves with each blow, equivalent to a continuos 170 dB (re: 1 μPa). Based on these estimates of peak sound pressure levels, the report concluded that fish less than 30 meters away could experience permanent auditory system damage, temporary and possibly permanent loss of equilibrium or complete incapacitation. The report included a brief discussion of previously unreported studies that show beyond a brief startle response associated with the first few acoustic exposures, fish do not move away from areas of very loud noises and can be expected to remain in the area unless they are carried away by the river currents (NOAA Fisheries 2001b).

In the Pacific Northwest, fish mortality and/or fish distress has been observed during installation of steel piles using impact hammers on several occasions. At the Mukilteo ferry dock, during impact hammer installation of 24 inch and 30 inch steel pilings, juvenile striped surfperch floated to the surface (WA State Ferries 2001). Recently, the Department of Ocean and Fisheries Canada related that fish mortality of juvenile salmon, perch, and herring occurred during impact pile driving of 36" steel pilings at the Canada Place Cruise Ship Terminal in Vancouver, B.C. In both instances, fish did not appear to be injured when a vibratory hammer was used. At the Port of Vancouver, fish did not appear to be injured when the piling consisted of cement or wood (Salome 2002).

The timing restrictions and other practical considerations for construction are highly likely to reduce the chance of experiencing anything other than short term effects described above. Therefore, adverse effects from pile driving effects of the proposed action are expected to be minimal to PS chinook. Driving of concrete piles, using an impact hammer, is expected to minimal because it appears, at this time, that concrete piling has a greater ability to absorb the energy generated. Adverse effects from the driving of the steel piling is expected to be minimal due to the area where they will be driven (close to MHHW), where it is expected that the tide will only be present 2 percent of the time during the construction window (NOAA 2000). If steel piling is driven when water is present, the contractor will "dry fire" the impact hammer to disperse any fish in the immediate area. If steel pilings are used for the fender system, hydroacoustic monitoring will be preformed to ensure that sound levels are below injurious and lethal limits. Additionally, few adult chinook are expected to enter the project area as the Blair Waterway is not on the migration path to the Puyallup River (Pacific International Engineering 2001). And, in order to minimize potential adverse effects on water quality during pile driving, the pile driving will be conducted in a manner that is consistent with the Water Quality Certification and Short-Term Modification to the Washington State Water Quality Standards as administered by the Department of Ecology.

2.1.5.1.3 Habitat Construction

The Port proposes to construct an intertidal beach at a small peninsula located on the eastern side of the Hylebos Waterway immediately bayward of East 11th Street. The site is owned by the Puyallup Tribe of Indians and is adjacent to Tribal land that has been designated for habitat conservancy and restoration. The peninsula separates a quiescent mudflat from the commercialized Hylebos Waterway. The upland's current elevations along this peninsula are from +11.8 ft. to +18 ft. MLLW. The Port's proposed habitat enhancement is to excavate and grade a portion of the peninsula, and create a gently sloping upper intertidal profile by importing suitable sized gravels. The site would be cleaned of undesirable materials and then graded to connect with existing habitat in the Puyallup River estuary/Commencement Bay area. The type of habitat to be created has been identified as limiting in Commencement Bay (Graeber 1999, Simenstad 2000) and is an important step toward improving the overall ecological functionality of the action area (baseline improvement). The Port will also monitor for fish migration and rearing and for epibenthic invertebrates populations to ensure long term habitat function.

NOAA Fisheries believes this beach will successfully provide additional habitat capacity and improve ecological functions for salmonids, including PS juvenile chinook. Other beaches constructed similar to this have been shown to provide comparative benefits to salmon as a natural beach. Examples in the immediate vicinity include the Milwaukee Waterway mitigation beach and the Slip One mitigation beach. Both of these sites have provided ecological attributes critical to juvenile chinook salmonid. These attributes include shallow water refugia, prey production, aquatic plants, detrital inputs, and diverse micro- and macro- biotic assemblages. The Milwaukee mitigation beach includes upland planting along the entire shore. NOAA Fisheries expects that this riparian vegetation will contribute to ecological functions important to juvenile salmonid early marine life.

2.1.5.2 Indirect Effects

Indirect effects are caused by or result from the proposed action, are later in time, and are reasonably certain to occur (50 CFR 402.02). In direct effects may occur outside of the area directly affected by the action. Indirect effects may include other Federal actions that have not undergone section 7 consultation but will result from the action under consideration. These actions must be reasonably certain to occur, or they are a logical extension of the proposed action.

2.1.5.2.1 Water Quality

There are generally several adverse effects associated with impervious surfaces and industrial activity. Impervious surfaces do not directly affect chinook but may indirectly affect them by degraded water quality or changes in water temperature. Best Management Practices (BMP) will be in place during construction activities and during upland operations to ensure that no debris, waste material, or hazardous substance will enter the Blair Waterway. The stormwater drainage/treatment systems will be improved at the two existing outfalls located under the PCT pier and also at the one new outfall that will be constructed to replace the stormwater line that connects to the Wapato Creek culvert.

Water quality limitations have been identified as examples of potential causes of injury to listed fish in both final and draft regulations developed to implement the ESA (NOAA Fisheries, 1998b; NOAA Fisheries 1998c). Runoff from urban, or industrial areas, has been shown to contain many different type of pollutants, depending on the nature of the activities in the area (Department of Ecology 2001). The Environmental Protection Agency (EPA) has identified contaminants from drains, seeps, open channels and other point and non-point sources within Commencement Bay. NOAA’s concerns about the Commencement Bay area involve the adverse effects to the habitat caused by the release of hazardous substances with consequent contamination of sediments on the bottom of the Bay (NOAA 2002).

Adverse effects from water quality effects are expected to be minimal because the overall project includes stormwater drainage/treatment system improvements to the two existing outfalls located under the PCT pier and the one new outfall that will be constructed to replace the stormwater line that connects to the Wapato Creek culvert. All stormwater improvements will provide enhanced treatment to remove debris, nutrients, sediment, petroleum hydrocarbons, metals and other pollutants likely to be present using the best available technology applicable to site conditions. Additionally, BMPs will be employed during construction and by the tenant for long term protection.

2.1.5.2.2 Overwater Structures

The existing PCT pier structure extends for 1,400 feet along the southern side of the Blair Waterway. The new 1,200 foot pier, pier extension, and truck accessways will shade an additional 1.6 acres of intertidal and shallow subtidal habitat. The riprap shoreline habitat beneath the piers will be sloped at a two height to one vertical incline from the top of the slope to -10 MLLW. To offset effects from pier construction, 1.36 acres of shallow subtidal and intertidal will be created in the Hylebos Conservancy site, 144 existing creosote pilings will be removed, and widely spaced concrete pilings will be used for structural support. Additionally, the truck accessways have been designed to use the minimum turning radius needed to reduce shading impacts.

Overwater structures and associated activities can impact the ecological functions of habitat through the alteration of habitat controlling factors, such as light regime, wave energy regime, substrate, and water quality. These alterations can, in turn, interfere with habitat processes supporting the key ecological functions of spawning, rearing, and refugia. Whether any effects occur and to what degree they occur at any one site depend upon the nature of site-specific habitat controlling factors and the type, characteristics, and use patterns of a given overwater structure located at a specific site (Nightingale and Simenstad 2001).

Docks, piers, and pilings greatest impact can be the shade cast upon the underwater environment that limits the light availability for photosynthesis. Distributions of invertebrates, fishes, and plants have been found to be severely limited in under-dock environments when compared to adjacent vegetated habitat not shaded by over water structures (Fresh *et al* 1995, 2000; Ludwig *et al* 1997; Orth and Moore 1983; Parametrix and Batelle 1996; Thayer *et al* 1984; Thom *et al* 1996, 1997) Large, densely located pier aggregations such as the industrial shipping areas within Commencement Bay contain large piers and aprons with light levels reduced by 2 - 4 orders of magnitude. Based upon light behavior criteria identified by Ali (1959), light levels in areas under the industrial docks in the Action Area near the outer edges are considered high enough to facilitate feeding and schooling of juvenile salmon. However, areas nearer to dock bulkheads and at times of ship presence have shown reduced light levels where cessation of schooling and feeding would occur (Ratte and Salo 1985). Overwater structures may also generally increase the exposure of juvenile salmon to potential predators by diverting juveniles into deeper water upon encountering the dock or by altering prey detection through alterations to light and turbidity (NOAA Fisheries 2001a).

Adverse effects from over-water structure effects to PS chinook are expected to be minimal because of the minimization measures and the restoration measures that were provided for in the BA. The addition of a new pier and extension will increase the amount of intertidal shading by 1.6 acres, but will be offset by the creation of 1.36 acres of shallow subtidal and intertidal in the Hylebos Conservancy site and by the permanent removal of 144 creosote pilings from the environment. Not all of the chinook coming out of the Puyallup River will encounter the new pier or extension due to the tendency for chinook to use the mouths of the waterways. Additionally, the use of cement pilings will provide greater light illumination over the use of traditional wood piling due to the ability to use fewer piling and the more reflective surface of cement.

2.1.5.2.3 Artificial Lighting

The new 1,200 foot pier will be illuminated by four new light poles with twelve (12) 1,000-watt high-pressure sodium floodlights each. The existing PCT pier and extension will be illuminated by six new light poles with 12 floodlights each. To offset the effects of artificial lighting, lighting will be directed toward working surfaces away from the water, the lights will be equipped with external glare shields, and the high mast light fixtures will be located over 300 feet away from the face of the piers.

The potential delay in migration is one of the concerns regarding artificial lighting (Ratte and Salo, 1985). The first weeks in the marine environment are critical to survival and factors that alter normal behavior could have adverse effects on juvenile salmonids (Parker 1965, 1971). Mark-recapture studies on juvenile chum salmon conducted at the Bangor Submarine Base showed that the marked fish had no measurable residence at the Explosives Handling Wharf (Prinslow *et al* 1980). This indicated that the security lighting did not seem to affect the migratory behavior of marked chum (Prinslow *et al* 1980).

Potential behavior changes due to artificial lighting have raised additional concerns about how this might relate to predation rates. The concern is that the predators may be attracted either to the light itself or to the abundant prey near artificial lighting**.** Ratte and Salo (1985) examined four locations under piers in the Port of Tacoma where artificial lighting was installed underneath the pier and could not determine that there was an increase in predators because of the lighting. The Bangor site also produced inconclusive results to the harm accrued by salmon from the use of security lighting (Salo *et al* 1980). Despite the lack of conclusive studies, NOAA Fisheries believes that new pier lighting should be designed to mimic natural light levels and photoperiods by reducing the amount of added light that hits the water.

Artificial light cast from the new pier is not expected to adversely impact PS chinook as it would not be directed onto the surface of the water, lighting will be directed toward working surfaces away from the water, the lights will be equipped with external glare shields, and the high mast light fixtures will be located over 300 feet away from the face of the piers.

2.1.5.2.4 Shoreline Stabilization

The Port's proposed action would move the current shoreline back 560 feet on the northeast side creating a shoreline 734 feet longer. The new shoreline created will be sloped on the eastern portion at a 2 to 1 slope from the top of the slope to -10 MLLW, and at a 1.75 to 1 slope from -10 to -51 MLLW. A portion of the southwest side slope will be dredged and inclined at a 2 to 1 slope above -10 MLLW and at a 1.5 to 1 slope between -10 and -51 MLLW. All slopes between the top of the slope and -51 MLLW will be rip-rapped. Above -10 the interstices of the rock will be filled with two and one-half minus angular rock to improve benthic invertebrate biological production to improve benthic invertebrate biological production and below -10 MLLW will be filled with sandy dredge material.

Shoreline stabilization structures are generally designed to dissipate wave energy, maintain navigation channels, control shoreline erosion, repair storm damage, protect from flooding, store or accumulate sediment, and promote commercial or recreational activity. The stabilization of shorelines using bank hardening structuress interrupts the natural wave and current erosion of bluffs and banklines in the Action Area, which in turn interferes with sediment recruitment. The use of shoreline stabilization methods can also alter substrate composition, increases the slope of the shoreline, and affects the natural succession of riparian plants (Kerwin 1999). Besides simplifying shorelines and reducing intertidal habitat area (Douglas and Pickel 1999) these modifications have direct effects on nearshore processes and the ecology of many species (MacDonald *et al* 1994, Thom *et al* 1994). For example, the composition of benthic substrate in nearshore marine and estuarine habitats are linked to local physical conditions and greatly influences biological resource functional benefits (Thom *et al* 2001). A number of studies at the Port of Tacoma, Port of Seattle, and other locations within urban environments have examined the recolonization of intertidal and shallow substrate that has been disturbed (Jones and Stokes Associates 1990a, 1990b, 1995, Hiss *et al* 1990). The results indicated that recolonization is rapid and that substantial densities of prey are available within a short period (months) of substrate disturbance (Pacific International Engineering 2001).

To minimize the effects of shoreline stabilization on PS chinook, the Port will place two and one-half inch minus angular rock in the riprap interstices between the top of the slope and -10 ft MLLW. This measure will improve chinook prey production at the shoreline stabilization sites by providing a higher quality substrate to improve biological production, i.e., production of benthic invertebrates. Between -10 ft and -51 ft MLLW, sandy dredged material will be used to cover the riprap.

2.1.5.2.5 Increased Shipping

Effects associated with the berthing and departure of vessels may generally include prop wash, antifouling paint used to protect vessel hulls, oil spills from increased bunkering activity, and the introduction of non-indigenous species. When a vessel berths, the pilot must assist the tug operator by using bow thrusters and propellers to maneuver the ship. Vessels themselves can generate approximately 244,000 cubic feet per minute current, with an added 114,000 cubic feet per minute when using the bow thruster and propeller (NOAA Fisheries 2001a). The water quality effects associated with this disturbance are likely similar to those that occur during dredging but are of shorter duration. Continually disturbing the sediments may lead to a potential loss of benthic and fish prey resources which may not develop a biologically productive community. Most slopes are rip-rapped within this area and therefore are resistant to erosion from ship wakes and propellers. The U.S. Coast Guard regulates federal and international laws concerning the control of contaminants and hazardous material handling for shipping operations. Measures are also being undertaken on a nationwide basis in response to the 1995 reauthorization of the National Invasive Species Act to reduce risks of introducing non-indigenous species through ballast water exchange. The DOE and the Washington State Fish and Wildlife Department also impose separate restrictions concerning vessel operations.

The marine antifouling paint on the ship's hull may also affect marine organisms, including fish, within the waterways. One of the most commonly used marine antifouling paints for the ships are the tributytin (TBT) self-polishing copolymers. A large body of literature has shown tributytin has a very high toxicity to aquatic organisms and can cause mortality, deformity, immune suppression and endocrine disruption at very low levels (Rexride and Spatz 1997).

Another contaminate source that could increase with expanded activity or a change in the type or ownership of vessels is the risk of fuel oil or other spills into the waterway. For example, a spill of 7,500 gallons of fuel oil occurred in the Sitcum Waterway in January 1998. About half of the ships entering Commencement Bay in 2000 that were screened by WA State Department of Ecology's Spill Prevention Program were rated a moderate to high risk level. Spills are intermittent events; however the screening process indicates that the risk of environmental damage is significantly increased by shipping activities (USFWS 2001).

Ballast water has been identified as a mode of introduction of non-indigenous invertebrates (Cohen *et al* 1998). A number of non-indigenous invertebrates have been identified from infauna and epifauna collections in the action area of Commencement Bay. It is important that the operation of marine shipping facilities in Puget Sound evaluate this issue and manage ballast water consistent with existing and future state, national, and international programs and guidelines. After July 1, 2002, discharge of ballast water within Washington State waters is authorized only if open sea exchange has occurred or if it has been treated to meet standards set by the Department of Fish and Wildlife (Pacific International Engineering 2001).

Increased shipping activity is not expected to adversely impact PS chinook because most slopes are rip-rapped and therefore resistant to erosion from ship wakes and propellers. Additionally, marine shipping operations in Puget Sound, including operations in Commencement Bay, will be consistent with current and future guidelines and requirements implemented by state and federal agencies and with international shipping controls.

2.1.6 Cumulative Effects

Cumulative effects are defined as "those effects of future State or private activities, not involving Federal activities, that are reasonable certain to occur within the action area of the Federal action subject to consultation" (50 C.F.R. 402.02). Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

The Port of Tacoma, along with the Port of Seattle, are second only to Los Angeles/Long Beach, California in container traffic for all U.S. ports. Tacoma has almost 40 percent of the land available on the U.S. West Coast for container development and is actively working at upgrading road systems and railways to enable cargo to move quickly in and out of the port. The Port of Tacoma's vision for the future includes spending $250 million in capital projects to accommodate larger ships, stimulate business growth, and to meet the Port's public responsibility. Virtually every future action to develop or restore will require a COE permit, and likely NOAA Fisheries review.

Restoration actions are taking place as a part of Commencement Bay Natural Resource Damage Assessment pursuant to CERCLA (Kerwin 1999). Landscape and watershed scale restoration sites have also been identified to increase connectivity between critical salmon habitat transition regions (Simenstad 2000). It is particularly difficult to detect, with confidence, the effects of habitat improvements based on observed run size trends. It has been estimated that, because of inherent variability, it would take 30 years to detect a 50 percent improvement in average production, if we were to use adult run size as the response variable (Lichatowich and Cramer 1979, Mobrand Biometrics 2001).

2.1.7 Conclusion

NOAA Fisheries determines whether the action is likely to jeopardize the listed species by determining if the species can be expected to survive with an adequate potential for recovery. In making this determination, NOAA Fisheries must consider the estimated level of injury or death attributable to: (1) collective effects of the proposed or continuing action, (2) the environmental baseline, and (3) any indirect or cumulative effects. This evaluation must take into account measures for survival and recovery specific to the listed species' life stages.

NOAA Fisheries reviewed the status of the PS chinook, the environmental baseline for the action area and the direct, indirect, and cumulative effects of the proposed action. By itself, the proposed dredging and pier construction will reduce the function of habitat indicators (that are presently functioning at risk) in the immediate area of this part of the action. Furthermore, the proposed 1.6 acres of pier and pier extensions will impair the ability of habitat indicators that are not properly functioning to improve. Except for the flats at the mouth of the Puyallup River, nearshore habitat in the head of Commencement Bay is limited and what remains is mostly non-functional for PS chinook. However, with the minimization measures incorporated, the action's adverse effects are offset to the extent that the proposed action will result in continuing slight improvement in the ecological function of habitat conditions within the action area. Based on the forgoing, it is NOAA Fisheries' biological opinion that the action is not likely to jeopardize the continued existence of PS chinook. In arriving at a non jeopardy conclusion for this action, the minimization measures were important to consider against the incremental degradation, attributable to the new over-water structure and dredging effects, relative to the existing not-properly functioning baseline condition of the Puyallup River delta and the Commencement Bay nearshore environment.

The establishment of 1.36 acres of new upper intertidal habitat in the Hylebos Waterway will increase the capacity of this habitat in the estuary for juvenile salmonids and important forage fish. While the data suggests significantly more chinook are dependent on the nearshore closer to the mouth of the Puyallup River, and in the Milwaukee and Sitcum Waterways, the habitat action in the Hylebos Waterway will contribute to increasing function of habitat for rearing juvenile chinook.

NOAA Fisheries finds that likely potential negative effects associated with the actual construction activities would be expected to be minimized or eliminated through the adherence to the project design objectives.

2.1.8 Reinitiation of Consultation

This concludes formal consultation on this proposed action in accordance with 50 C.F.R. 402.14(b)(1). The COE must reanalyze this ESA consultation if: (1) new information reveals effects of the action that may affect listed species in a way not previously considered:(2) new information reveals the action causes an effect to listed species that was not previously considered; or (3) a new species is listed or critical habitat designated that may be affected by the identified actions.

2.2 Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species without special exemption. “Take” is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct of listed species without a specific permit or exemption (50 C.F.R. 217.12) “Harm” is further defined by the NOAA Fisheries Final Rule to include significant habitat modification or degradation that results in death or injury to a listed species by “significantly impairing essential behavioral patterns such as breeding, spawning, rearing, migrating, feeding, and sheltering” (50 C.F.R. 222.102). “Incidental take” is take of listed animal species that results from, but is not the purpose of, the Federal agency or the applicant carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action, is not considered prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

An incidental take statement specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize the effects and sets forth terms and conditions with which the action agency must comply in order to implement the reasonable and prudent measures.

2.2.1 Amount of Extent to Take Anticipated

NOAA Fisheries anticipates that incidental take of PS chinook is reasonably certain to occur from the project activities. Despite the use of the best scientific and commercial data available, NOAA Fisheries cannot estimate a specific amount of take of individual fish. While direct injury or death may unintentionally result during construction activities and biological monitoring, harm is more likely to accrue by exposure of fish to further degradation of the nearshore environment during juvenile rearing and migration. For the purposes of this Opinion, the extent of take is correlated to the extent of habitat affected and the number of individuals captured during biological monitoring of the beach creation. Accordingly, the reasonable and prudent measures were developed to address the extent of habitat effects, as described below.

2.2.2 Reasonable and Prudent Measures

The following reasonable and prudent measures (RPMs) are necessary and appropriate to minimize the take of PS chinook. These RPMs are partially integrated into the BA and proposed project. NOAA Fisheries has included them here to provide further detail as to their implementation.

1. The COE will minimize take during construction by avoiding or minimizing adverse effects of construction activities on PS chinook.

2. The COE will minimize take after construction by avoiding or minimizing adverse effects on habitat and behavior caused by stormwater runoff associated with the underlying project.

3. The COE will minimize take by ensuring the long-term function of habitat restoration and creation activities include in the proposed action

2.2.3 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the parties must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms are non-discretionary. The COE should include these terms and conditions as permit requirements under the Federal permit issued by the COE under Section 10 of the Rivers and Harbor Act and Section 404 of the Clean Water Act.

1. To implement reasonable and prudent measure 1:

    a) The COE shall ensure that pile driving, dredging, and other in-water work, including construction of the mitigation site, shall not occur between March 1 and July 15 of any year.

    b) The COE shall require that steel pile driving will take place in the dry, if possible. If steel pile driving must take place when water is present near MHHW, the contractor shall "dry fire" the hammer to disperse fish in the area prior to driving. If steel piles are used for the fender system, hydroacoustic monitoring shall take place. The hydro acoustic monitoring shall consist of:

        i) Underwater sound levels monitored at three meters depth and 10 meter distance from the pile driving site. If hydroacoustic monitoring from the first five piles do not indicate sound levels exceeding 150 dB (re: 1 µPa) at three meters depth and 10 meters distance from the pile, no additional hydroacoustic monitoring is needed as pile driving continues. The energy to drive the first five piles shall be representative of the maximum energy used on the subsequent piles. If levels exceed 150 dB (re: 1 μPa) 50 percent of the time or less but does not exceed 180 dB (re: 1 μPa) during the first five piles, pile driving may continue along with continued hydroacoustic monitoring or, at the Port's option, pile driving may continue without hydroacoustic monitoring with the use of an appropriate sound attenuation minimization measure as discussed below. If levels exceeded 150 dB (re: 1 μPa) more than 50 percent of the time or exceeded 180 dB (re: 1 μPa) during the first five piles, pile driving may only continue with the use of an appropriate sound attenuation minimization measure as discussed below. The Port shall notify the COE and NOAA Fisheries of the results of the hydroacoustic monitoring from the first five piles within 72 hours.

ii) Based on the outcome of the above described hydroacoustic monitoring, an appropriate sound attenuation minimization measure, such as one of the following, shall be employed. Methods to minimize the underwater sound pressure level may include reducing the force of each strike, or attenuating the underwater sound by enclosing the pile in an air bubble curtain or pile sleeve.

iii) A report shall be submitted to the COE and NOAA Fisheries within 30 days of completion of the project that presents the results of the hydroacoustic monitoring conducted during the project. The following data shall be provided in the report: size and type of pile; approximate energy supplied to the pile; frequency and amplitude of the underwater sound; angle of the pile; water depth, distance from shore or bulkhead; and type and depth of substrate.

2. To implement reasonable and prudent measure 2:

a) The COE shall require that the quality of stormwater runoff be controlled for the life of the project by providing water quality treatment to remove debris, nutrients, sediment, petroleum hydrocarbons, metals and other pollutants likely to be present using the best available technology applicable to site conditions.

3. To implement reasonable and prudent measure 3:

a) The Port of Tacoma shall conduct fish surveys at the proposed intertidal beach in the Hylebos Waterway (to identify migration and rearing) to apply to years 1, 3, and 8 subsequent to the completion of construction. Five surveys shall be conducted at the created beach, and at a suitable reference beach, using a 30 meter beach seine between julian days 51-60; 100-120; 140-160; 180-200; and 210-255 in each of these years.

b) Minimize direct take of salmon during sampling by: ensuring that sufficient qualified technicians are on-site to quickly process each net sample; minimizing the time that the fish are entangled in the net; placing each fish in a container of water immediately after removal from the net; measuring fork lengths while fish are immersed in water; releasing all fish immediately after processing; and observing the behavior of fish after release to confirm live release.

c) Sampling of epibenthic invertebrates shall coincide with fish surveys conducted between julian days 100-120; 140-165; 180-200; and 210-225 in each sampling year.

d) Incorporation of 8-12 pieces of large woody debris into the site design. The wood shall be anchored to prevent it from floating away.

3.0 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

3.1 Background

The MSA as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance EFH for those species regulated under a Federal fisheries management plan. Pursuant to the MSA:

- Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (§305(b)(2));
- NOAA Fisheries shall provide conservation recommendations for any Federal or State activity that may adversely affect EFH (§305(b)(4)(A));
- Federal agencies shall within 30 days after receiving conservation recommendations from NOAA Fisheries provide a detailed response in writing to NOAA Fisheries regarding the conservation recommendations. The response shall include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the conservation recommendations of NOAA Fisheries, the Federal agency shall explain its reasons for not following the recommendations (§305(b)(4)(B)).

EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA §3). For the purpose of interpreting this definition of EFH: Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR 600.110). Adverse effect means any impact which reduces quality and/or quantity of EFH, and may include direct (*e.g.*, contamination or physical disruption), indirect (*e.g*., loss of prey or reduction in species fecundity), site-specific or habitat-wide effects, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

Any reasonable attempt to encourage the conservation of EFH must take into account actions that occur outside EFH, such as upstream and upslope activities, that may have an adverse effect on EFH. Therefore, EFH consultation with NOAA Fisheries is required by Federal agencies regarding any activity that may adversely affect EFH, regardless of its location.

The objective of this EFH consultation is to determine whether the proposed action may adversely affect designated EFH, and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects to EFH resulting from the proposed action.

3.2 Identification of EFH

Pursuant to the MSA the Pacific Fisheries Management Council (PFMC) has designated EFH for federally-managed fisheries within the waters of Washington, Oregon, and California. The designated EFH for groundfish and coastal pelagic species encompasses all waters from the mean high water line, and upriver extent of saltwater intrusion in river mouths, along the coasts of Washington, Oregon and California, seaward to the boundary of the U.S. exclusive economic zone (370.4 km)(PFMC 1998a, 1998b). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC), and longstanding, naturally-impassable barriers (i.e., natural waterfalls in existence for several hundred years)(PFMC 1999). In estuarine and marine areas, designated salmon EFH extends from the nearshore and tidal submerged environments within state territorial waters out to the full extent of the exclusive economic zone (370.4 km) offshore of Washington, Oregon, and California north of Point Conception to the Canadian border.

Detailed descriptions and identifications of EFH are contained in the fishery management plans for groundfish (Casillas et al. 1998, PFMC 1998a), coastal pelagic species (PFMC 1998b), and Pacific salmon (PFMC 1999). Assessment of the effects to these species' EFH from the proposed action is based on these descriptions and information provided by the COE.

3.3 Proposed Actions

The proposed action and action area are detailed above in Section 1 of this Opinion. The action area includes habitats that have been designated as EFH for various life-history stages of 17 species of groundfish, four coastal pelagic species, and three species of Pacific salmon (Table 1).

Table 1. Species of fishes with designated EFH in the estuarine composite of Puget Sound.

Groundfish Species	Sablefish *Anoplopoma fimbria*	**Coastal Pelagic Species**
Spiny Dogfish *Squalus acanthias*	Bocaccio *S. paucispinis*	anchovy *Engraulis mordax*
California Skate *R. inornata*	Brown Rockfish *S. auriculatus*	Pacific sardine *Sardinops sagax*
Ratfish *Hydrolagus colliei*	Copper Rockfish *S. caurinus*	Pacific mackerel *Scomber japonicus*
Lingcod *Ophiodon elongatus*	Quillback Rockfish *S. maliger*	market squid *Loligo opalescens*
Cabezon *Scorpaenichthys marmoratus*	English Sole *Parophrys vetulus*	**Pacific Salmon Species**
Kelp Greenling *Hexagrammos decagrammus*	Pacific Sanddab *Citharichthys sordidus*	chinook salmon *Oncorhychus tshawytscha*
Pacific Cod *Gadus macrocephalus*	Rex Sole *Glyptocephalus zachirus*	coho salmon *O. kisutch*
Pacific Whiting (Hake) *Merluccius productus*	Starry Flounder *Platichthys stellatus*	Puget Sound pink salmon *O. gorbuscha*

3.4 Effects of Proposed Action

As described in detail in Section 2.1.5 of this Opinion, the proposed action may result in detrimental short- and long-term effects to a variety of habitat parameters. These adverse effects are:

1. Short term effects on sound levels in the project area from pile driving.

2. Long term degradation of water quality (pollutants) because of stormwater effects from upland activities.

3. Long term loss of habitat through substrate conversion.

4. Short term degradation of water quality (turbidity) because of in-water construction activities.

5. Short term degradation of benthic foraging habitat from dredging activities.

3.5 Conclusion

NOAA Fisheries believes that the proposed action may adversely impact the EFH for the groundfish, coastal pelagic, and Pacific salmon species listed in Table 1.

3.6 EFH Conservation Recommendations

Pursuant to Section 305(b)(4)(A) of the MSA, NOAA Fisheries is required to provide EFH conservation recommendations to Federal agencies regarding actions that would adversely affect EFH. While NOAA Fisheries understands that the conservation measures described in the BA will be implemented by the COE, it does not believe that these measures are sufficient to address the adverse effects to EFH described above. Consequently, NOAA Fisheries recommends that the COE implement the following conservation measures to minimize the potential adverse effects to EFH for the species in Table 1:

- Adopt Terms and Conditions 1b-3, as described in Section 2.2.3, to minimize EFH adverse effects Nos.1-3.

3.7 Statutory Response Requirement

Please note that the MSA and 50 CFR 600.920(j) require the Federal agency to provide a written response to NOAA Fisheries' EFH conservation recommendations within 30 days of its receipt of this letter. The response must include a description of measures proposed to avoid, mitigate, or offset the adverse effects of the activity. In the case of a response that is inconsistent with the EFH Conservation Recommendations, the response must explain the reasons for not following the recommendations, including the scientific justification for any disagreements over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effects.

3.8 Supplemental Consultation

The COE must reinitiate EFH consultation with NOAA Fisheries if the proposed action is substantially revised in a manner that may adversely affect EFH, or if new information becomes available that affects the basis for NOAA Fisheries' EFH conservation recommendations (50 CFR 600.920(k)).

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